

REGION 10 ANNOTATED VERSION -- JUNE 12, 2000
DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Boeing Renton
Facility Address: 800 N 6th St. Renton, WA 98055
Facility EPA ID #: WAD 009 262 171

1. Has all available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been considered in this EI determination?

 x If yes - check here and continue with #2 below.

 If no - re-evaluate existing data, or

 if data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

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Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is groundwater known or reasonably suspected to be “contaminated”¹ above appropriately protective “levels” (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

☒ If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

☐ If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

☐ If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s): RFI in 2001 (Reference 1) and the supplemental remedial investigations (Reference 2) identified several areas contaminated with VOCs and TPHs at the levels that corrective measure (CM) is required. AOC-90 area was the most heavily contaminated area (Reference 3), but most of the contaminated soils were removed from this area in 2004 (Reference 4). Enhanced bioremediation is being implemented for groundwater, and VOC and TPH concentrations are reduced (VC: 160 ug/L, cis-1,2-DCE: 930 ug/L, TCE: 1.1 ug/L, TPH-G: 29 mg/L, TPH-D: 0.71 mg/L and TPH-MO: 1.1 mg/L) (Reference 5). In AOC-1/2 area, groundwater is still contaminated with VOC (VC: 3,900 ug/L, cis-1,2-DCE: 360 ug/L) (Reference 5). Like AOC-90 area, the contaminated soils were removed from AOC-1/2 area, and enhanced bioremediation is being implemented (Reference 6). Several other areas (SWMU-172/174, Buildings 4-78/79 area, Former Fuel Farm, AOC-3, AOC-4, AOC-34/35, AOC-60, AOC-92 and AOC-93) are also contaminated with VOCs and TPHs (References 1, 5, 7 and 8). Currently proposed cleanup levels for groundwater VOCs and TPHs are: 0.05 – 0.29 ug/L for VC; 0.02 – 2.4 ug/L for cis-1,2-DCE; 0.02 – 0.23 ug/L for TCE, 0.8 mg/L for TPH-G; 0.5 mg/L for TPH-D; and 0.5 mg/L for TPH-MO.

References: 1. Remedial Investigation Report, August 2001, by Weston; 2. Feasibility Study Work Plan, April 2004, by Geomatrix; 3. AOC-90 Interim Report Building 4-65 Yard, September 2000, by Weston; 4. Boeing Renton AOC-90 Interim Action Results Memorandum, July 8, 2004, by Geomatrix; 5. Quarterly Groundwater Monitoring Report, First Quarter 2009, June 5, 2009, by Geomatrix; 6. Boeing Renton AOC-001 and AOC-002 Interim Action Results Memorandum, prepared by Geomatrix, January 27, 2006; 7. Feasibility Study Report, June 2008, by Geomatrix; 8. Draft pre-Cleanup Action Plan Investigation Results, prepared by AMEC, August, 2008.

Footnotes:

¹“Contamination” and “contaminated” describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

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3. Has the migration of contaminated groundwater stabilized (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"² as defined by the monitoring locations designated at the time of this determination)?

This question focuses ONLY on the movement of contaminated groundwater, not the level of contamination. A "YES" response should be arrived at if, through interpretation of groundwater flow data or sound professional judgement, groundwater contamination can be shown to not be expanding in spatial extent. It is perfectly acceptable to have a "YE" groundwater EI if:

- 1) contaminated groundwater is located off-site but not migrating further;
- 2) contaminated groundwater is contaminated above cleanup standards, but not migrating further;
- 3) natural attenuation is occurring such that the rate of attenuation (through any of the acceptable attenuation mechanisms and in accordance with EPA's Monitored Natural Attenuation Guidance, Directive 9200.4-17 - December 1997 Use of Monitored Natural Attenuation at Corrective Action Sites) is such that the outer boundaries of the plume are not expanding.

 x If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"²).

 If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"²) - skip to #8 and enter "NO" status code, after providing an explanation.

 If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): VC is the main contaminant at downgradient, and the most recent quarterly groundwater monitoring (Reference 1) indicates that VC concentrations at the downgradient wells are lower than the acceptable VC discharge level (3.7 ug/L) determined by the risk analysis for exposure to recreational use and fish consumption, assisted by EPA-10. Since most of known contamination sources were removed, significant increase of VC concentration in groundwater is unlikely.

Reference: 1. Quarterly Groundwater Monitoring Report, First Quarter 2009, June 2009, by AMEC

2 "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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4. Does "contaminated" groundwater discharge into surface water bodies?
 ☒ If yes - continue after identifying potentially affected surface water bodies.
 _____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.
 _____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s): _____ Affected surface water bodies are Lake Washington and the Cedar River.

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5. Is the discharge of "contaminated" groundwater into surface water likely to be "insignificant" (i.e., the maximum concentration³ of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?
- ☒ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration³ of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.
- _____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration³ of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations³ greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.
- _____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s): _____ VC is the main constituent detected at the wells located along the shoreline of the Cedar River and Lake Washington throughout the facility. These wells are located 50 to 200 feet away from the shoreline. The highest VC concentration detected was 1.5 ug/L at SWMU-172/174 area, but this well is located more than 100 feet away from the shoreline. The closest well to the shoreline is located

50 feet away in the AOC-1/2 area. VC concentration in this well was 0.4 ug/L. These VC levels are lower than the acceptable discharge level (3.7 ug/L) determined by the risk analysis for exposure to recreational use and fish consumption, assisted by EPA-10. Other wells along the shoreline did not detect VC greater than the acceptable discharge level. In addition, most of known sources of contamination were removed, therefore, significant increase of VC contamination in groundwater is unlikely.

Reference: 1. Quarterly Groundwater Monitoring Report, First Quarter 2009, June 2009, by AMEC

³ As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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6. Can the discharge of "contaminated" groundwater into surface water be shown to be "currently acceptable" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented⁴)?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,⁵ appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "currently acceptable") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

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Rationale and Reference(s): _____

⁴ Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

⁵ The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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7. Will groundwater monitoring / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

☒ x If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that

When considering discharge of groundwater to surface water, it is important to remember that some discharges may be considered acceptable - it is not necessary to demonstrate that there are no discharges, or that groundwater meets surface water criteria at the point of discharge, as may be the case with final cleanup levels. As with human exposures controlled and other groundwater criteria, sound professional judgement may be used in evaluating the impact of groundwater to surface water.

The GW/SW component of the 750 EI really has three parts: 1) is there a discharge; 2) is the discharge insignificant; and 3) is the discharge currently acceptable (questions 4-6, respectively). A YE EI may be obtained if appropriate responses can be made through following this three-step analysis (no discharge, discharge insignificant, or discharge acceptable, respectively). Note that the level of supporting analysis and/or data increases as you progress through these three steps - a finding that a discharge is acceptable for a particular water body requires a considerably more complex analysis than a finding that there is no discharge.

Another point to recognize is that surface water issues often involve ecological risk considerations, and that such ecological evaluations often require specialized professional evaluation. Never the less, the quantity of data and effort required for analysis of groundwater/surface water EI questions should not be significantly different than what is required for human exposures or other groundwater questions. Evaluation of surface water from an EI perspective should not require a disproportionate effort.

groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s): Quarterly groundwater monitoring has been conducted more than 10 years, and will be continued. Potential discharge of contaminated groundwater into the surface water bodies is monitored at the following wells: GW081S, GW172S and GW173S at SWMU-172/174; GW143S at Building 4-78/79 Area; GW185S, GW186S, GW194S, GW195S, GW196D and GW197S AOC-1/2/3; GW218S at AOC-34/35; GW149S, GW150S, GW159S and GW160S at AOC-60; GW177I, GW178S, GW179I, GW180S, GW208S, GW207S, GW175I and GW176S at AOC-90. The cleanup action plan will require long term monitoring of these wells and additional wells proposed as point of compliance wells.

Reference: 1. Quarterly Groundwater Monitoring Report, First Quarter 2009, June 2009, by AMEC; 2. Draft Cleanup Action Plan, October 2008, by AMEC

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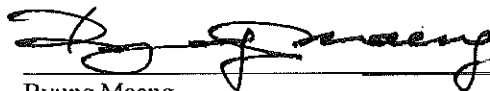
8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

☒ **YE** - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the **Boeing Renton facility**, EPA ID # **WAD 009262171**, located at **800 N 6th St, Renton, WA 98055**. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ **NO** - Unacceptable migration of contaminated groundwater is observed or expected.

_____ **IN** - More information is needed to make a determination.

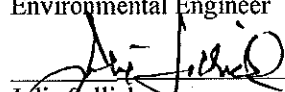
Completed by



Byung Maeng
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Date: July 6, 2009

Supervisor



Julie Sellick
Section Manager
Hazardous Waste and Toxics Reduction Section
Department of Ecology

Date: July 10, 2009

Locations where References may be found:

Department of Ecology, Northwest Regional Office in Bellevue, Washington
The Boeing Company's Renton Plant
City of Renton Library

Contact telephone and e-mail numbers

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